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Status of Commercial Spent Nuclear Fuel Storage in the United States

Kevin A. McMahon, Manager
Nuclear Waste Disposal Research and Analysis
Sandia National Laboratories

AIT-TECRO JSCCNC
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Taiwan

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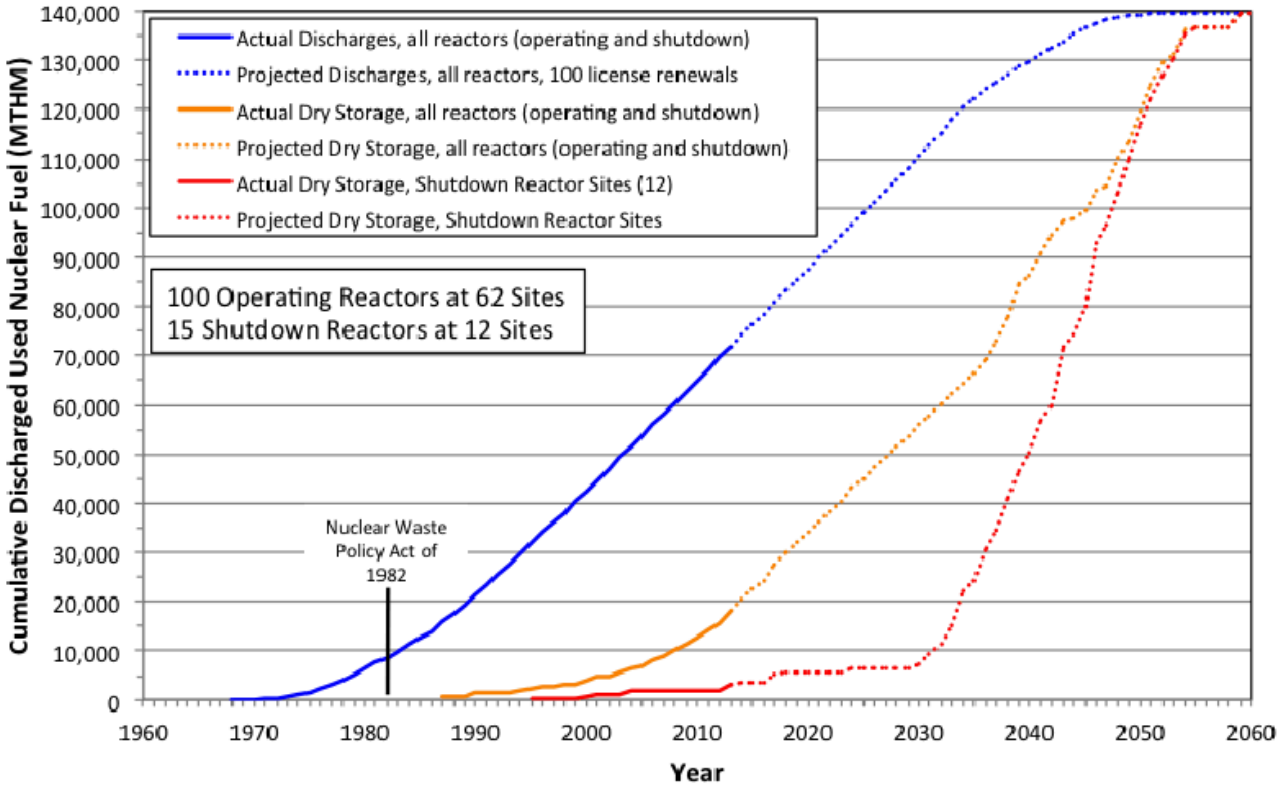
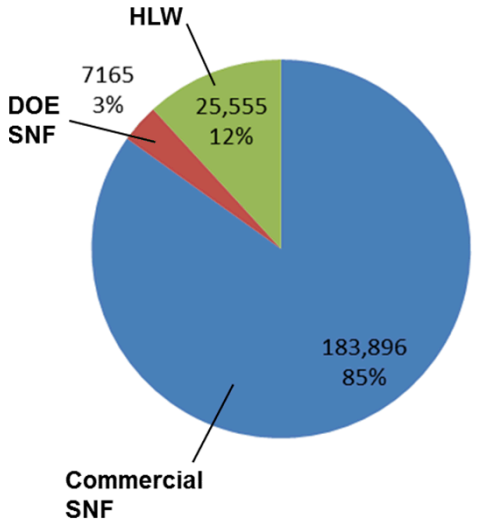
Historical and Projected Spent Nuclear Fuel (SNF) and High-Level Radioactive Waste (HLW) in the United States



Historical and Projected Commercial SNF Discharges

Projected Volumes of SNF and HLW in 2048



***Volumes shown in m^3**, assuming constant rate of nuclear power generation and packaging of future commercial SNF in existing designs of dual-purpose canisters*

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Presentation Outline

- **US Department of Energy's Used Fuel Disposition (UFD) Program**
  - Disposal Research
  - Storage and Transportation (S&T) Research
- **Scope of the UFD S&T R&D program**
  - High Burnup Spent Fuel Data Project
- **Proposed Private Interim Storage Facilities**
  - Holtec International – Eddy Lea Energy Alliance
  - Waste Control Specialists – AREVA & NAC International

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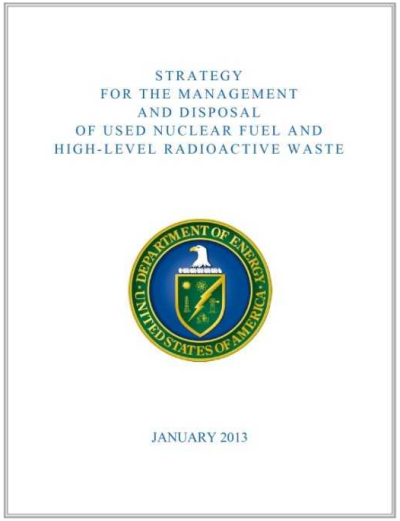
US DOE Used Fuel Disposition (UFD) R&D Campaign

The *DOE Office of Used Nuclear Fuel Disposition Research and Development and nine national laboratories participate in the DOE Office of Nuclear Energy's "Used Fuel Disposition Campaign"*

Campaign Mission:

to identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles



Support the Administration's 2013 *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*

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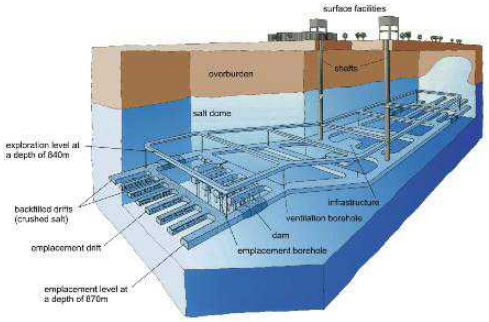
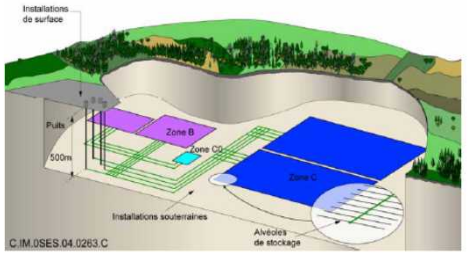
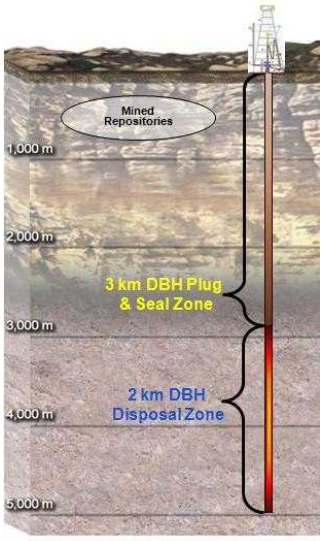
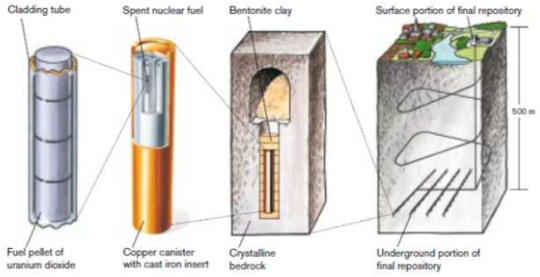
UFD Campaign Strategic Focus: Disposal R&D

- Provide a sound technical basis for multiple viable disposal options in the US
- Increase confidence in the robustness of generic disposal concepts
- Develop the science and engineering tools needed to support disposal concept implementation









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UFD Campaign Strategic Focus: Storage and Transportation (S&T) R&D

Prepare for extended storage and eventual large-scale transport of used nuclear fuel (UNF) and high-level waste

- **Develop additional confidence in the technical basis for:**
  - Extended storage of used nuclear fuel
  - Fuel retrievability and transportation after extended storage
  - Transportation of high-burnup used nuclear fuel

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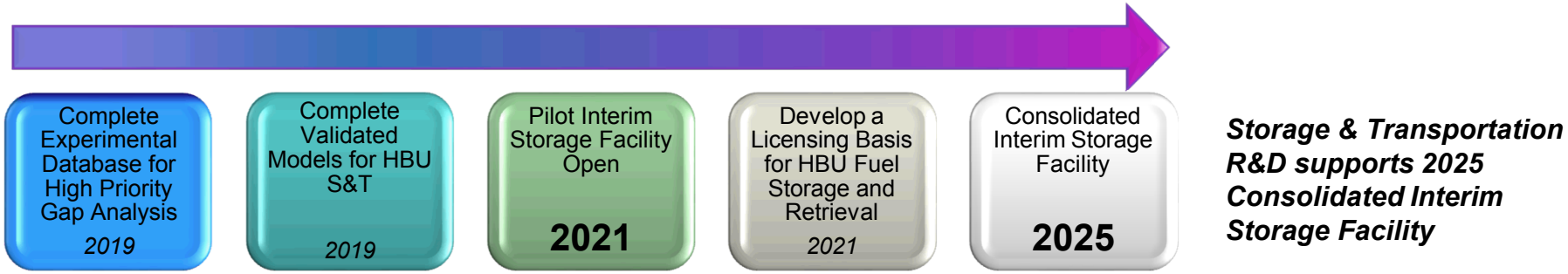
Priorities for UFD S&T

Storage and Transportation R&D Activities

- Collaborate with industry in designing and fielding a ***full-scale high-burnup dry storage demonstration test***
- R&D to support the storage demonstration test
- Develop data and models for performance of fuel, cladding, canister, and canister internals in storage and transportation environments



Storage & Transportation R&D supports 2025 Consolidated Interim Storage Facility

See DOE FY2016 Congressional Budget Request vol. 3, p. 452-455, available at http://www.energy.gov/cfo/downloads/fy-2016-budget-justification

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Why Do the High Burnup Spent Fuel Data Project?

- **We need data to confirm our understanding of degradation mechanisms over extended periods of time.**
  - Need the capability to store fuel for more than 20 years and then be capable to transport
  - Little data are publicly available on the behavior of high burnup fuel during dry storage and its subsequent handling and transportation.
  - The physical state of high burnup cladding when fuel is placed into dry storage
  - Cladding-degradation mechanisms, their interactions with fuel pellets, and the expected behavior of cladding
  - Conditions that affect degradation mechanisms, such as predictions of the fuel temperatures over time and the amount of residual water present after drying.

TN 32 that is very similar to the cask that will be used for the project

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High Burnup Spent Fuel Data Project: Participants

Industry: contract was awarded to EPRI on April 16, 2013

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Dominion

AREVA Federal Services
AREVA Transnuclear
AREVA Fuels

Westinghouse

National Labs

Sandia National Laboratories

INL Idaho National Laboratory

Pacific Northwest NATIONAL LABORATORY

Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

Savannah River National Laboratory™
OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

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High Burnup Spent Fuel Data Project: Project Schedule

Major Milestones

- 12/31/14: Trans Nuclear completes Design and Licensing Basis Document
- 1/31/15: Phase 1 sister rods extracted
- 6/30/15 Phase 2 sister rods extracted
- ***7/31/15: Dominion submits Licensing Amendment Request to NRC***
- 1Q16: Sister rod shipment
- 1/31/17: Expected US Nuclear Regulatory Commission review completion
- 3/15/17: Cask Delivered to North Anna (PWR reactor site)
- 6/30/17: Dry run and functional tests complete
- 7/31/17: Cask loading complete – begin initial monitoring
- 8/21/17: Cask emplaced at pad/begin at-pad monitoring

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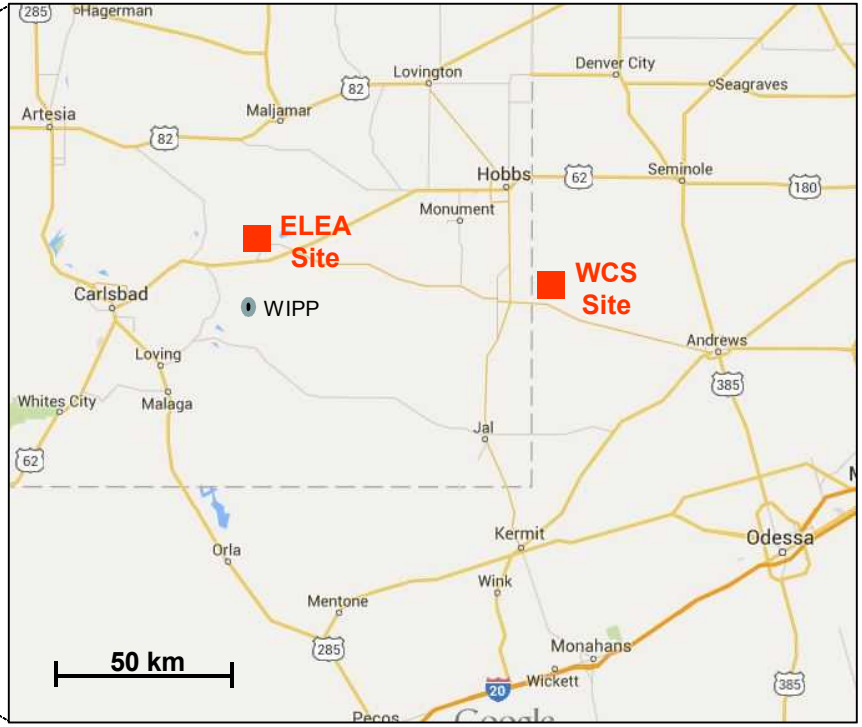
Proposed Private Interim Storage Facilities in the Southwestern USA



Carlsbad is ~50 km from ELEA and ~100 km from WCS in the Delaware Basin, which is the modern geologic expression of a Permian-age (~ 255 Ma) topographic depression

Basin geology is broadly characterized by carbonate reef rocks (Capitan Formation) surrounding evaporite rocks deposited in a shallow sea

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Proposed Private Interim Storage: WCS/NAC International/AREVA

WCS/NAC International/AREVA
Proposed Private Interim Storage Facility

Proposal:

- Letter of intent filed with the US Nuclear Regulatory Commission (NRC) setting April 2016 as date for license application
- Initial phase of operation 2020
- Far west Texas (Andrews, Texas)
- 60-100 years of dry storage
- Housed in steel-reinforced concrete

http://wcsstorage.com/project-overview/

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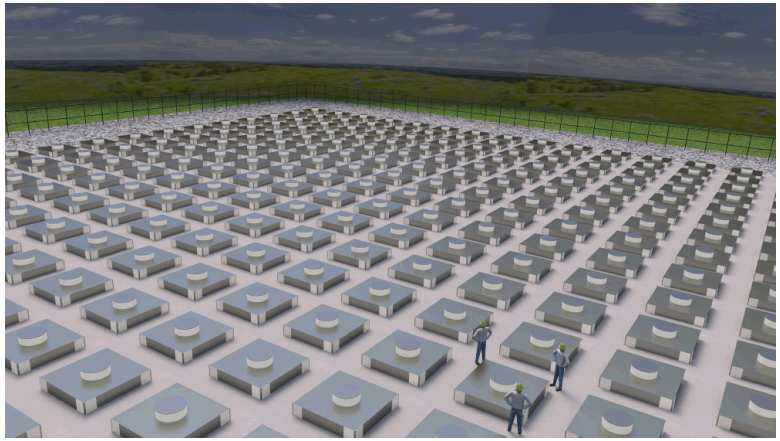
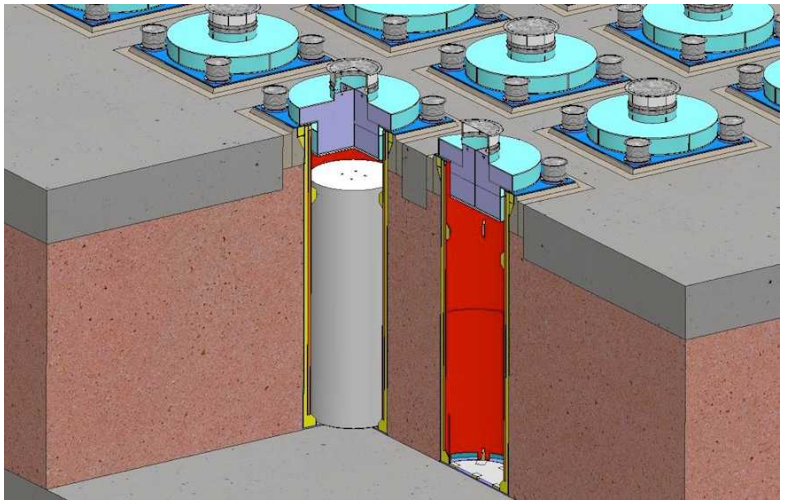
Proposed Private Interim Storage: ELEA/Holtec

Eddy Lea Energy Alliance (ELEA), LLC
and Holtec International
Proposed Private Interim Storage Facility



Proposal:
- 75,000 metric tons U in 32 acres (Southeast New Mexico, USA)
- 100 year service life
- Letter of intent sent to US Nuclear Regulatory Commission (NRC) August 2015
- Apply for NRC permit within a year of May 7, 2015
- Facility operations within next 4-5 years

HI-STORM UMAX
Holtec Intl. Storage Module
Underground MAXimum Capacity



- Underground storage canisters
- Vertical Ventilated Model (VVM) dry fuel storage
- Compatible with all presently certified multi purpose canisters MPCs

http://www.prweb.com/releases/2015/05/prweb12708274.htm
http://www.holtecinternational.com/productsandservices/consolidated-interim-storage-facility/